

GILLETTE

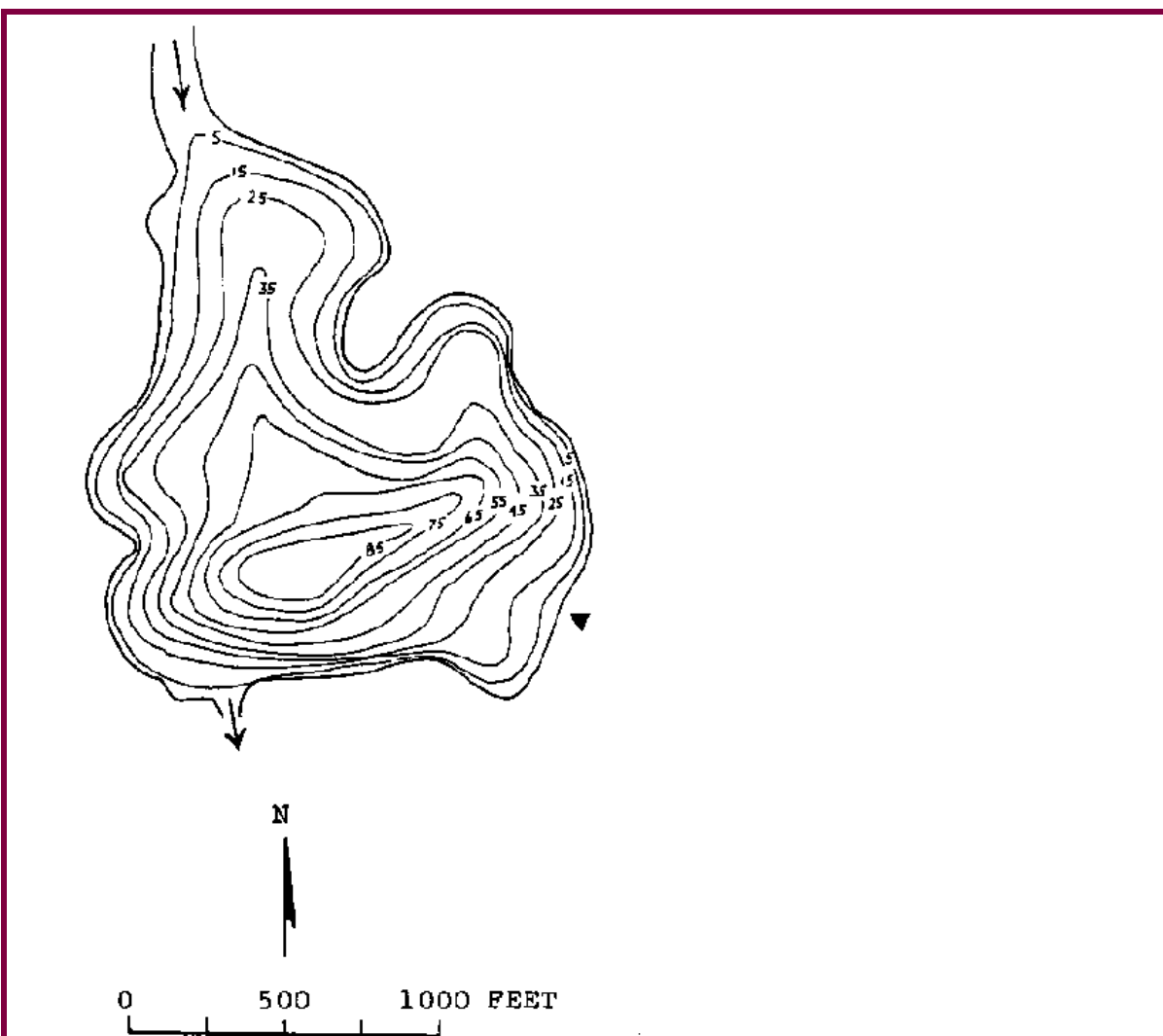
STEVENS County

Lake ID: GILST1

Ecoregion: 8

Lake Gillette is the fourth lake in the Little Pend Oreille chain of lakes. It is located approximately 20 miles northeast of Colville just south of the Pend Oreille County line.

<i>Area (acres)</i>	<i>Maximum Depth (ft)</i>	<i>Mean Depth (ft)</i>	<i>Drainage (sq mi)</i>	
47	85	34	15	
<i>Volume (ac-ft)</i>	<i>Shoreline (miles)</i>	<i>Altitude (ft abv msl)</i>	<i>Latitude</i>	<i>Longitude</i>
1600	1.27	3160	48 36 43.	117 32 35.



Station Information

GILST1

Primary Station	Station # 1	latitude: 48 36 42.0	longitude: 117 32 24.0
	Description: Deep site: North and slightly east of outlet to Sherry.		
Secondary Station	Station # 2	latitude: 48 36 50.0	longitude: 117 32 20.0
	Description: Mid-lake on a line between the USFS access and the tip of the peninsula at the north end.		

Trophic State Assessment for 1999

GILLETTE

Analyst: MAGGIE BELL-MCKINNON

TSI_Secchi:	^a 38	J
TSI_Phos:	50	
TSI_Chlor:	35	
Narrative TSI:	^b M	

Summary Comments:

The general water clarity of Lake Gillette was good in 1999. The Secchi depth readings ranged from 3.9 meters (12.8 feet) to 4.7 meters (15.3 feet) with a mean Secchi depth of 4.3 meters (14.3 feet). For comparison, in 1998 the mean Secchi depth was 3.9 meters (12.9 feet).

No geese and only a few other waterfowl were observed on the lake by the volunteer monitor during his sampling visits made between June and September.

The chemistry data collected for Lake Gillette showed high phosphorus levels. Values ranged from 22.4 ug/L to 26.3 ug/L in the epilimnion and hypolimnetic readings of 269.0 ug/L to 722.0 ug/L. The chlorophyll levels showed low algae densities in the lake. The phosphorus data indicates a level of productivity where algae growth could be heavy, last long and potentially interfere with the beneficial uses of the lake.

Ecology staff made six site visits in 1999. Thermal stratification and low dissolved oxygen levels in the hypolimnion were noted during each of these visits.

Ecology staff conducted an aquatic plant survey on 7/27/1999. The nonnative plant *Nymphaea odorata* (fragrant waterlily) grew in large patches and codominantly with other native plants like *Brasenia schreberi* (watershield). The nonnative plant *Iris pseudacorus* (yellow flag) also occurred in a few locations around the lake. Lake Gillette was treated with 2,4-D (Sonar) on 7/21/1999. During Ecology's plant survey of 7/27/1999 staff commented the submersed plant growth seemed reduced (perhaps because of the Sonar treatment) with macroalgae and floating leaved plants the most prevalent vegetation in the lake.

Based on the Secchi depth data, and the phosphorus and chlorophyll levels, Lake

Gillette is classified as mesoeutrophic.

The following is an assessment written by Ecology staff, Sarah O'Neal, to determine the phosphorus criterion for Lake Gillette:

Lake Gillette is a small, deep lake located in a relatively large drainage. A USFS campground bordered about half of the lake, and the rest was residential. The lake displayed both oligotrophic and mesoeutrophic characteristics. Secchi readings and chlorophyll levels indicated oligotrophy. Good clarity in the lake remained fairly constant throughout the summer. Total phosphorus levels, however, were notably high, at mesoeutrophic levels. TN:TP ratios may be caused by nitrogen limitation, which would explain why the mean Secchi and chlorophyll concentrations were so much lower than mean total phosphorus concentrations would indicate. Chemistry data revealed particularly high phosphorus in the hypolimnion, indicating internal nutrient loading in which nutrients are released from the sediment into the water column. This often occurs with low dissolved oxygen concentrations near the lake bottom, as clearly indicated by the Hydrolab profile data. Low dissolved oxygen also often leads to hydrogen sulfide near the bottom of the lake, causing an offensive, "rotten-egg" smell, and yellow-colored hypolimnetic water, documented throughout the summer. Watershed condition possibly caused the high phosphorus levels in the lake, considering the large size of the watershed relative to the small lake. The primarily residential watershed also contained agricultural, park, forest, and natural land, and a main highway. Several best management practices observed in the watershed included cattle gates and protection from erosion. However, some homeowners around the lake appeared to use fertilizers, which may contribute to higher nutrient levels in the lake. Macrophytes grew fairly densely in the lake, without causing particular problems, however. A 1997 Sonar treatment to control the aggressive, non-native plant, Eurasian watermilfoil (*Myriophyllum spicatum*) in addition to a 1999 2,4-D treatment possibly reduced plant densities below normal levels. The milfoil subsided since treatment.

No questionnaires were distributed for the lake. During site visits, uses included fishing and water-skiing. The lake appeared both aesthetically pleasing, as well as inviting to swimmers. WDFW managed the fishery for cutthroat trout. They rehabilitated the lake with Rotenone in 1997 in an attempt to curb continued growth of exploding populations of pumpkinseed, sunfish, and yellow perch. Pumpkinseed returned to the lake since the treatment. Five thousand cutthroat yearlings were planted annually in the lake since the treatments.

Despite elevated phosphorus levels, Lake Gillette supported a variety of beneficial uses. Therefore, we recommend a total phosphorus criterion of 27.8 ug/L (mean 23.4 ug/L plus standard deviation of 4.4 ug/L). Due to limitations of the sampling conducted during this study, it is difficult to determine whether nitrogen is also limiting to the system, though this appears likely. Future studies may propose a nitrogen criterion. Consequently, nitrogen applications in the watershed, for example forest

fertilization, should be carefully managed.

Mean Secchi = 4.6m; Mean TP = 23.4 ug/L; Mean Chl = 1.6 ug/L

^a TSI Qualifiers: B or W-Secchi Disk hit bottom or entered weeds; J-Estimate; N-Fewer than the required number of samples

^b E=eutrophic, ME=mesoeutrophic, M=mesotrophic, OM=oligomesotrophic, O=oligotrophic

Chemistry Data

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Date	Time	Strata	Tot P (ug/L)	Tot N (mg/L)	TN:TP	Chloro- phyll (ug/L)	Fecal Col. Bacteria (#/100mL)	Hardness (mg/L)	Calcium (ug/L)	Turbidity (NTU)
Station 0										
6/16/1999		L					4			
		L					3			
7/14/1999		L					5			
		L					5			
8/11/1999		L					2			
		L					6			
9/15/1999		L					1 U			
		L					3			
Station 1										
6/16/1999		E	25.5	.168	7	1.5		19.1	5690	.5
		H	691	3.4	5					
6/22/1999		E	26.3							
7/14/1999		E	23.1	.216	9	1.81				1
		H	269	1.27	5					
8/11/1999		E	22.4	.206	9	1.4				.6
		H	722	3.05	4					
9/15/1999		E	22.1	.193	9	1.7				.5
		H	668	3.9	6					
Station 2										
6/16/1999		E	23.2	.182	8	1.2				
7/14/1999		E	22.3	.209	9	1.57				
8/11/1999		E	23.5	.208	9	1.4				
9/15/1999		E	22.8	.192	8	1.8				

Strata: L=lake surface, E=epilimnion, H=hypolimnion; Qualifier: J=Estimate, U=Less than, G=Greater than.

Watershed Survey

GILLETTE

Survey Date: 9/15/1999

Land Uses (1 = Primary, 2 = Secondary, etc.)

Land Uses (1 = Primary, 2 = Secondary, etc.)

<input type="text" value="2"/> Agriculture (commercial, not hobby)	<input type="text" value="1"/> Residential
<input type="text"/> Commercial, Industrial	<input type="text" value="3"/> Park, forest or natural
<input type="text" value="4"/> Major transportation	

Impervious surfaces (Roads and parking area): No Curbs

Observations (check mark denotes presence)

BMP's ☒

Bank sloughing at USFS; cattle gate near outlet. Logs cabled together at peninsula to protect against erosion of low bank. Boulders in water near swimming beach to reduce erosion.

Odors ☐

Cattle ☐ **Ducks** ☒ **Geese** ☐

Fertilizers and weed killers appear to be used in residential or agriculture area ☒

Some homes along west shore.

Buffer zones around streams and wetlands ☐

Irrigation ☐

Survey Id:

Habitat Survey Summary Report

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Data are averages of 10 Stations Surveyed

Date of Visit: 7/27/1999

Vegetation Type (Avg. only of sites w/ vegetation present; 1=coniferous, 3=deciduous)

Canopy Layer Avg:	1.0	Number of stations with canopy:	9
Understory Avg:	2.4	Number of stations with understory:	10

Percent Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

Canopy Layer:	trees > 0.3 m DBH	2.1
	trees < 0.3 m DBH	1.4
Understory:	woody shrubs saplings	2.4
	tall herbs, forbs grasses	0.8
Ground Cover:	woody shrubs seedlings	2.1
	herbs, forbs, grasses	3.1
	standing water or inundated veg	0.1
	barren or buildings	1.0

Substrate Type (within shoreline plot):	bedrock	0.0
	boulders	0.3
	cobble/gravel	0.1
	loose sand	0.1
	other fine soil/sediment	0.4
	vegetated	3.6
	other	0.0
<hr/>		
Bank Features:	angle (O:<30; 1: 30-75; 2:nr vertical)	1.1
	vertical dist (M from wtrln to high wt):	0.2
	horiz. dist. (M from wtrln to high wt):	0.1
<hr/>		
Human Influence (0 = absent, 1 = adjacent to or behind plot, 2 = present within plot)		
	buildings	0.7
	commercial	0.0
	park facilities	0.4
	docks/boats	0.7
	walls, dikes, or revetments	0.2
	litter, trash dump, or landfill	0.0
	roads or railroad	0.0
	row crops	0.0
	pasture or hayfield	0.0
	orchard	0.0
	lawn	0.7
	other	0.2
<hr/>		
Physical Habitat Characteristics		
	station depth (m; at 10 m from shore)	1.3
<hr/>		
Bottom Substrate (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)		
	bedrock	0.0
	boulders	0.1
	cobble	0.2
	gravel	1.0
	sand	2.3
	silt	1.8
	woody debris	0.7
<hr/>		
Macrophyte Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)		
	submergent	1.5
	emergent	0.3
	floating	2.0
	total weed cover	2.4
	Do macrophytes extend lakeward (-1 = yes, 0 = no)	-1.0

Fish Cover (0 = absent, 1 = Present but sparse, 2 = moderate to heavy)

aquatic weeds	1.9
snags	0.0
brush or woody debris	0.3
inundated live trees	0.0
overhanging vegetation	0.7
rock ledges or sharp dropoffs	0.1
boulders	0.1
human structures	0.1

Zooplankton Report

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Date 6/16/1999 Station: 1 Slightly more than 0.5mLs counted. Many rotifers in sample.
Sample ID 82

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.88

Date 6/16/1999 Station: 2 Counted slightly less than 1.5mLs. Many rotifers in sample.
Sample ID 81

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.71

Date 8/11/1999 Station: 1
Sample ID 54

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.47

Date 8/11/1999 Station: 2 Site two duplicate.
Sample ID 55

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.38

Date 8/11/1999 Station: 2 Lots of parts and/or shells, not many whole critters.
Sample ID 58

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.55

Aquatic Plant Data

GILLETTE

Sampler: Parsons, O'Neal

Survey Date: 7/27/1999

Max depth of growth (M): 5

Comments Sunny, hot. Heritage and Thomas lakes treated with 2,4-D 7/21/99. Brown water, submersed plant growth seems reduced, maybe because of Sonar treatment. Macroalgae and floating leaved plants the most prevalent things.

SPECIES LIST

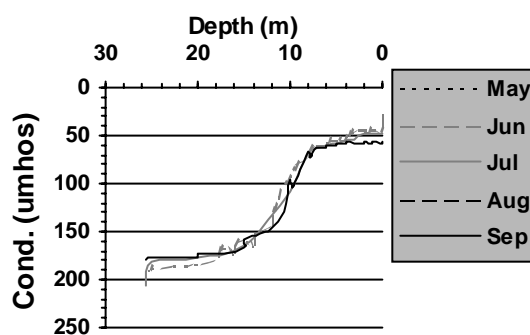
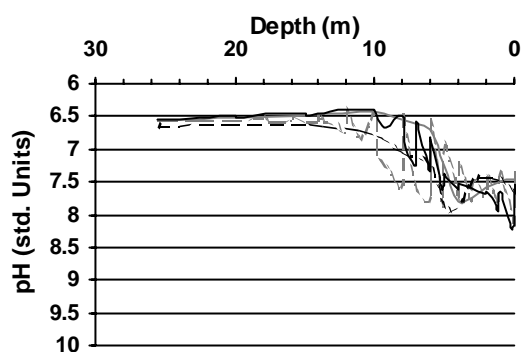
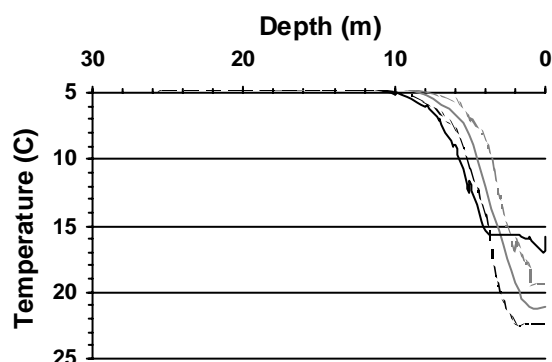
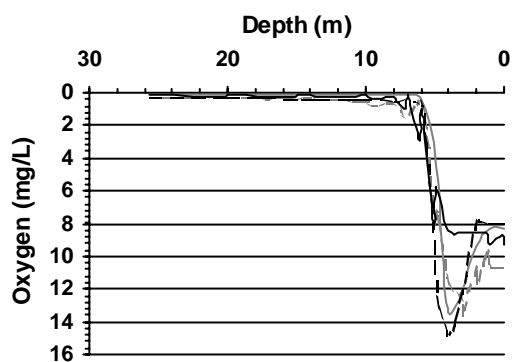
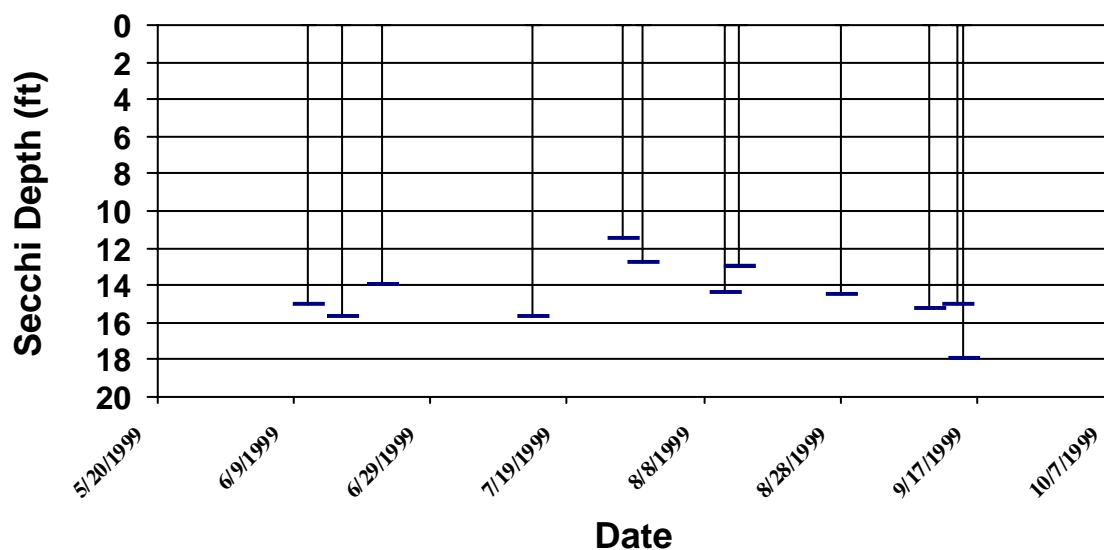
Scientific Name	Common Name	Dist ^a	Comments
<i>Brasenia schreberi</i>	watershield	3	
<i>Callitriche sp.</i>	water-starwort	1	long submersed leaves
<i>Carex sp.</i>	sedge	2	shoreline
<i>Chara sp.</i>	muskwort	2	
<i>Iris pseudacorus</i>	yellow flag	1	
<i>Juncus sp.</i>	rush	2	
<i>Myosotis sp.</i>	forget-me-not	1	
<i>Nitella sp.</i>	stonewort	3	
<i>Nuphar polysepala</i>	spatter-dock, yellow water-lily	2	
<i>Nymphaea odorata</i>	fragrant waterlily	3	some tiny with purple striped leaves
<i>Polygonum amphibium</i>	water smartweed	1	
<i>Potamogeton amplifolius</i>	large-leaf pondweed	1	
<i>Potamogeton epihydrus</i>	ribbonleaf pondweed	1	
<i>Potamogeton robbinsii</i>	fern leaf pondweed	1	
<i>Potamogeton sp (thin leaved)</i>	thin leaved pondweed	1	
<i>Ranunculus aquatilis</i>	water-buttercup	2	
<i>Scirpus sp.</i>	bulrush	2	
<i>unknown plant</i>	unknown	2	long tread-like leaves, may be S. subterminalis

a 0 - value not recorded (plant may not be submersed)	1 - few plants in only 1 or a few locations
2 - few plants, but with a wide patchy distribution	3 - plants in large patches, codominant with other plants
4 - plants in nearly monospecific patches, dominant	5 - thick growth covering substrate to exclusion of other species

Secchi Depth and Profile Graphics

Station: 1

GILST1



Secchi Data and Field Observations

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Date	Time	Temp- erature (F)	Secchi (ft)	Color (1-greens, 11-browns	Bright- ness (pct)	Wind (1-none, 5-gusty)	Rainfall (0-none, 5-heavy)	Aesthetics (1-bad, 5- good)	Swimming (1-poor, 5- good)	Geese (#)	Waterfowl (besides geese #)	Boats- Fishing (#)	Boats- Skiing (#)
Station 1													
6/11/1999		62	15	2	25		3	5	5	0	2	3	
	Sampler: HAWK			Remarks: Used a view tube.									
6/16/1999			15.7	7	75	1	1	5	4	0	6	2	
	Sampler: HALLOCK			Remarks: H2S smell at all hypo depths. Hypo samples yellow. Oxygen dropped to 0.8 @ 6M. Took zooplankton tow from there. About 1/2 of shoreline is USFS campground, remainder is developed.									
6/22/1999		66	14	2	75	2	3	5	5	0	0	2	0
	Sampler: HAWK			Remarks: Used a view tube. No algae problems this spring. Only plant problem is Eurasian milfoil. Today's sampling weather was somewhat windy and threatening to rain.									
7/14/1999			15.7	7	5	2	1	5	4	0	9	2	
	Sampler: HALLOCK			Remarks: Bottom: 25.6M. Oxygen < 1 below 5M. H2S @ 10 and 15M. Waterfowl mostly grebes and ducks									
7/27/1999			11.48										
	Sampler: Parsons			Remarks:									
7/30/1999		73	12.83	2	75	1	1	5	5	0	0	0	1
	Sampler: STRAUSS			Remarks: Used a view tube.									
8/11/1999			14.4	6.5	50	1	1	4	4	0	4	2	
	Sampler: HALLOCK			Remarks: Bottom: 25.6M. USFS placed boulders along eroding bank to west of swimming beach. H2S at all hypo depths. Dissolved oxygen measurement qualified as an estimate due to calibration failing QA/QC requirements.									
8/13/1999		73	13	2	25	2	1	5	5	0	0	0	0
	Sampler: STRAUSS			Remarks: Used a view tube.									
8/28/1999		73	14.5	2	0	2	1	5	5	0	0	2	0
	Sampler: STRAUSS			Remarks: Used a view tube.									
9/10/1999		64	15.25	2	25	3	1	5	5	0	5	2	0
	Sampler: STRAUSS			Remarks: Used a view tube.									
9/14/1999			15										
	Sampler: STRAUSS			Remarks: No suspended algae or unusual water color. Fish were jumping - hatch was on! Sampling day was sunny and calm.									

Date	Time	Temp- erature (F)	Secchi (ft)	Color (1-greens, 11-browns)	Bright- ness (pct)	Wind (1-none, 5-gusty)	Rainfall (0-none, 5-heavy)	Aesthetics (1-bad, 5- good)	Swimming (1-poor, 5- good)	Geese (#)	Waterfowl (besides geese #)	Boats- Fishing (#)	Boats- Skiing (#)
9/15/1999			18	7	0	1	1	5	5	0	6	1	
Station 2	Sampler:	HALLOCK		Remarks:	Bottom: 25.6M. Hypo samples yellowish with H2S in all. Light mist on the water.								
6/16/1999			16.1	7	20	1	1						
	Sampler:	HALLOCK		Remarks:	Dissolved oxygen measurement qualified as an estimate due to calibration failing QA/QC requirements.								
7/14/1999			16.1	7	15	2	1						
	Sampler:	HALLOCK		Remarks:	Bottom: 21.8M.								
8/11/1999			15.7	6.5									
	Sampler:	HALLOCK		Remarks:	Bottom: 20.2M.								
9/15/1999			17.7	7									
	Sampler:	HALLOCK		Remarks:	Bottom: 18.8 M								